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(54) **Fungicidal compositions.**

(57) Fungicidal compositions for, and methods of controlling *Sclerotium cepivorum* infestation in allium plants which comprise applying to allium plants or their locus a fungicidally effective amount of a triazole compound of formula I.

**EP 0 539 332 A1**

The present invention relates to the use of triazole compounds and mixtures thereof in preventing, reducing or eliminating phytopathogenic fungus infestation of plants. In particular, the invention relates to the prevention, reduction or elimination of infection in plants attacked by organisms responsible for allium white rot.

## 5 BACKGROUND

Members of the allium group include leeks, garlic, dry bulb onions, Japanese bunching onion and the like. Onion plants are known to be particularly prone to infestation by *Sclerotium cepivorum* (onion white rot). Once the fungus is present in the soil it is difficult to eradicate or control since the sclerotia from the fungus may persist in the soil for long periods, measured in years, during which time the soil is unsuitable for the planting of onion crops. Chemical control is not feasible and treatment with current methods utilising iprodione (125 g/kg seed) as a seed treatment or procymidon (4-6 kg/ha) as soil treatment are not effective, particularly with heavy infestation of the fungus. Furthermore, treatment of soil with known fungicide compounds may result in phytotoxic effects or may otherwise have undesirable effects on the environment.

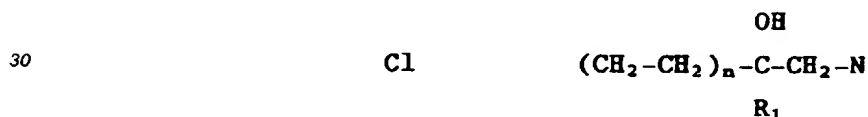
There exists a need for a more effective and/or environmentally more friendly control of *Sclerotium cepivorum* in the field.

It has now been found that certain known triazoles can act as surprisingly effective control agents against *Sclerotium cepivorum* infestation of allium plants at application rates showing good plant tolerance.

The term disease control resp. controlling as used herein is intended to relate to disease reduction, elimination or prevention. The term plant is intended to include plantlets, seedlings and seed.

## Detailed Description

According to the present invention there is provided a method of controlling *Sclerotium cepivorum* infestation in allium plants which comprises treating the plants or their locus with a fungicidally effective amount of a compound of formula I,



wherein n is 0 or 1,  
and R<sub>1</sub> is saturated C<sub>3-6</sub>hydrocarbyl.

Examples of saturated C<sub>3-6</sub>hydrocarbyl groups according to the invention, include C<sub>3-6</sub>alkyl, e.g. n-butyl or t-butyl, C<sub>3-6</sub>cycloalkyl, e.g. cyclopropyl and C<sub>3-6</sub>-(cycloalkyl-alkyl), e.g. 1-cyclopropylethyl.

The treatment according to the invention is conveniently effected with agriculturally acceptable composition forms of a compound of formula I. Preferably the compounds of formula I are applied to the seeds in the form of a seed dressing formulation. This has the concomitant advantage that the levels of fungicides which ultimately find their way into the soil are low, and do not significantly affect the environment.

Accordingly, the invention also provides a method of controlling *Sclerotium cepivorum* infestation in allium plants, preferably in onion seed comprising applying to allium seeds a coating containing a fungicidally effective amount of a triazole of formula I.

In another embodiment of the present invention, there is provided a coated seed of the allium group, preferably a coated onion seed comprising a fungicidally effective amount of a triazole of formula I in the coating.

The particular amount of triazole of formula I to be employed, will depend on various factors such as the particular active ingredient employed, the climatic conditions, and the like, however, in general satisfactory control may be obtained with seeds coated with from about 0.25 to about 12 g, preferably from about 0.5 to about 8.0 g of a triazole of formula I per kg of seed. The application rate is selected such that an optimum balance between disease control and plant tolerance is obtained. For cyproconazole the optimum amount broadly speaking lies within the range of from 0.25 to 4.0 g per kg allium seed, for tebuconazole the optimum amount lies within the range of from 1 to 6 g per kg allium seeds. (One kg onion seeds comprise approximately 250,000 seeds). The compounds of formula I have an excellent plant tolerance at the fungicidally effective rate.

Triazoles of formula I which may be used in the method of the present invention, include cyproconazole and tebuconazole. The triazole of formula I may be used as the sole active component, or, it may be mixed with other active triazole components according to formula I, or any other useful fungicidal component. Such

other fungicidal or active components may include non-triazole components such as iprodione, captan, met-alaxyl, oxadixyl, benomyl, thiabendazole, thiram, carbendazim or mixtures thereof. An example of such a mixture is a thiram: carbendazim mix used in a weight ratio of from about 1:1 to about 4:1. Other fungicides having a broad spectrum of fungicidal activity and/or are suitable for preventing or combatting seed or soil-borne diseases may also be used. The weight ratio of a triazole of formula I, especially in the case of tebuconazole or cyproconazole or a mixture thereof, to other fungicides, is not critical for the control of Sclerotium cepivorum. Effective and broad fungal control is for example, obtained by employing from 0.25 to 12 kg of a compound of formula I in conjunction with from 1 to 8 g of an aggregate amount of from about 1:1 to about 4:1, of a thiram : carbendazim mixture per kg onion seed. As an example, good disease control is obtained by employing 0.5 to 2 g of cyproconazole in conjunction with 3 g of an aggregate amount of a 2:1 thiram : carbendazim mixture per kg of onion seed.

In a further embodiment of the present invention, there are provided fungicidal compositions comprising a triazole of formula I or mixtures thereof in association with an agriculturally acceptable diluent for use against Sclerotium cepivorum infection in allium plants and especially for use on onion plants.

The term "diluent" as used herein includes any liquid or solid agriculturally acceptable material - including carriers - which may be added to the fungicidal constituents to augment their applicability and efficacy. Thus ease of application and a desirable activity may be achieved through the employment of such diluents.

The diluent may be chosen from such components as talcs, kaolin, diatomaceous earth, xylene, water and the like. When applying formulations in spray form, such as water dispersible concentrates or wettable powders, such forms may additionally include surfactants such as wetting dispersing agents.

The fungicidal compositions suitable for use according to the method of the invention may be in conventional formulation form, and obtained in conventional manner. Preferred compositions for use according to the invention are in seed dressing composition form.

The seed dressing compositions suitable for use in the method of the present invention typically include from about 5 % to about 50 % by weight of fungicide (triazole alone or in admixture with other triazoles or other active components) in association with from about 95 % to 50 % by weight of agriculturally acceptable diluent and preferably, adjuvants as commonly employed in the art.

Examples of agriculturally acceptable diluents and adjuvants suitable or use in such seed dressing formulations, include active carbon, kaolin clays polyvinylacetate and copolymers thereof, pigments and water.

A seed dressing formulation, e.g. as described above, may be applied in a manner known per se to seeds employing a compound of formula I and an agriculturally acceptable carrier in suitable seed dressing form such as an aqueous suspension or a dry powder form having good adherence to seed. Thus, the components of the seed dressing formulation may be applied to seed in a single application or layer, or may be applied in two or more layers depending on design. For example, an initial layer may comprise the addition of agriculturally acceptable diluents and/or adjuvants followed by the addition of a second layer comprising a compound of formula I and appropriate agriculturally acceptable diluents and adjuvants as hereinbefore described.

There now follow examples which illustrate the present invention. It is to be understood that the examples are not to be construed as limiting the scope of the claims in any way.

#### EXAMPLE 1: Seed dressing Formulation

25 parts	of cyproconazole
15 parts	of dialkylphenoxy poly(ethylenoxy)ethanol
15 parts	of fine silica
44 parts	of fine kaolin
0.5 parts	of pigment and
0.5 parts	of Xanthan Gum
100 parts	

are mixed and ground in a contraplex mill at approx. 10,000 rpm to an average particle size of below 20 microns. The resulting formulation is applied to the seeds as an aqueous suspension in an apparatus suitable for that purpose.

**EXAMPLE 2: Seed dressing Formulation**

5	45 parts	of cyproconazole or tebuconazole are mixed with
	1.5 parts	of diamyl phenoldecaglycolether ethylene oxide adduct
	2 parts	of spindle oil
	51 parts	of fine talcum and
10	0.5 parts	of colorant (Luconyl <sup>®</sup> - BASF)
	100 parts	

The mixture is ground in a contraplex mill at 10,000 rpm until an average particle size of less than 20 microns is obtained. the resulting dry powder has good adherence and may be applied to seeds, e.g. by mixing for 2 to 5 minutes in a slowly turning vessel.

**EXAMPLE 3: Seed dressing formulation**

4 g Aatopam-N (comprising 25 % by weight carbendazim and 50 % by weight thiram)  
 20 4 g of a conventional wettable powder formulation comprising 25 % by weight of tebuconazol  
 4 g of vinylacetate-ethylene copolymer  
 10 g of active carbon  
 10 g of kaolin clay  
 10 g of blue pigment (Luconyl<sup>®</sup> - BASF)  
 25 8 g of white pigment (titanium dioxide)  
 300 g of water.

The resulting formulation is applied to the seeds as an aqueous suspension in an apparatus suitable for that purpose.

**EXAMPLE 4**Fungicidal activity

4.1. Onion seeds (variety Jumbo) are treated with a mixture of  
 35 4 g Aatopam<sup>®</sup>-N (comprising 25 % by weight carbendazim and 50 % thiram)  
 8 g methyl cellulose  
 20 g kaolin clay  
 10 g pigment  
 and 250 g water  
 40 (hereinafter Formul. 4)  
 or with mixtures of said Formul. 4 with  
 1 g (Formul. 5)  
 3 g (Formul. 6) or  
 5 g (Formul. 7)  
 45 of a 25 % by weight wettable powder formulation of cyproconazole.

The treatments and obtained seeds are summarised in Table 1.

Table 1

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10	Treatment Example seed	Treatment	g active ingredient per kg
15	Control 1	Formul. 4 Formul. 5	2 g thiram + 1 g carbendazim 2 g thiram + 1 g carbendazim + 0.25 g cyproconazole
20	2	Formul. 6	2 g thiram + 1 g carbenzadim + 0.75 g cyproconazole
25	3	Formul. 7	2 g thiram + 1 g carbendazim + 1.25 g cyproconazole

30 Treated seeds are tested for germination and sown in the soil naturally infested with Sclerotium cepivorum in 8 replications. A count of diseased plants is made at weekly intervals and infested plants eliminated. The results are given in Table 2 as number of newly diseased plants on each count and total number of diseased plants counted throughout the trial. Subsequent to each count the diseased plants are eliminated.

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TABLE 2

a) - plants newly infested with white rot at each count as a percentage of the total number of plants counted in the trial.

Treatment Example	% infested plants at weekly intervals from sowing					
	week 1	week 2	week 3	week 4	week 6	week 7
Control	3	11	9	17	6	18
1	0	4	5	9	6	16
2	1	1	3	1	3	7
3	0	0	0	0	0	3

b) - Cumulative total of infested white rot plants at each count as a percentage of the total number of plants counted in the trial.

Treatment Example	% infested plants at weekly intervals from sowing					
	week 1	week 2	week 3	week 4	week 6	week 7
Control	3	14	23	40	46	64
1	0	4	9	18	23	39
2	1	2	5	7	10	16
3	0	0	0	1	1	4

4.2 Seeds coated according to Treatment Example 3 (see Example 4) are stored for 6 months. A germination trial performed at the end of the storage period shows germination of treated seeds to be unchanged from that of untreated seeds.

#### EXAMPLE 5: Granule Formulation

A granular carrier is uniformly impregnated in a ribbon blender with a 40 % fungicide/solvent mixture wherein the fungicide is cyproconazole or tebuconazole. It is allowed to dry and drying may conveniently be assisted by mixing or warming at a low temperature (e.g. 50°C).

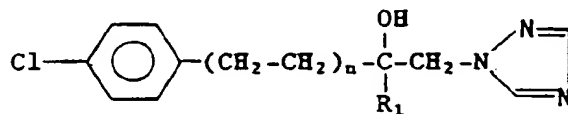
The granule formulation results having the following composition:

fungicide/solvent	2.5 parts
granular carrier	97.5 parts
	100.0 parts

in which the concentration of the fungicide is about 1 %. Suitable carriers may be attapulgit or other standard carriers. The thus obtained granules can be employed for soil treatment.

## Claims

1. A method of controlling Sclerotium cepivorum infestation in allium plants which comprises applying to allium plants or their locus a fungicidally effective amount of a compound of formula I



wherein n is 0 or 1,  
and R<sub>1</sub> is saturated C<sub>3-6</sub>hydrocarbyl.

2. A method according to Claim 1, which comprises applying to allium seeds a coating containing a fungicidally effective amount of a compound of formula I.
3. A method according to Claim 2 comprising applying from 0.25 to 12 g of a compound of formula I per kg of seed.
4. A method according to Claim 3 comprising applying from 0.5 to 8 g of a compound of formula I per kg seed.
5. A method according to Claim 4, comprising applying from 0.5 to 1.5 g of a compound of formula I per kg seed.
6. A method according to Claims 2 to 5, wherein the allium seeds are onion seeds.
7. A method according to any one of Claims 1 to 6, wherein the compound of formula I is cyproconazole.
8. A method according to any one of Claims 1 to 7, wherein the compound of formula I is tebuconazole.
9. A fungicidal composition for use in a method according to any one of Claims 1 to 8 comprising a fungicidally effective amount of a compound of formula I in association with one or more agriculturally acceptable diluents.
10. A fungicidal composition according to Claim 9 comprising a compound of formula I in association with iprodione, captan, metalaxyl, oxadixyl, benomyl, thiabendazole, thiram, carbendazim or mixtures thereof.
11. A composition according to Claim 10 comprising thiram : carbendazim in a weight ratio range of from 1:1 to 4:1.
12. A composition according to Claim 11 comprising from 0.25 to 12 weight units of a compound of formula I in admixture with 1 to 8 weight units of an aggregate amount of a 1:1 to 4:1 thiram : carbendazim mixture.
13. A composition according to any one of Claims 9 to 12 which is a seed dressing formulation.
14. Coated allium seeds, wherein the seed coating contains a fungicidally effective amount of a compound of formula I.
15. The use of a compound of formula I in a fungicidal composition for controlling Sclerotium cepivorum infection of allium plants.



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# EUROPEAN SEARCH REPORT

Application Number

EP 92 81 0799

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	JOURNAL OF PLANT DISEASES AND PROTECTION vol. 96, no. 6, 1989, STUTTGART pages 604 - 614 H.J.KRAUTHAUSEN 'Control of onion white rot (sclerotium cepirovum)' * the whole document *	1-9, 13-15	A01N43/653
Y	---	10-12	
Y	EP-A-0 316 970 (BAYER) * page 3, line 35 * * page 6, line 20 * * page 7, line 5 - line 9 *	10-12	
A	PLANT CELL PHYSIOL. vol. 27, no. 2, 1986, ROCKVILLE pages 367 - 371 R.A.FLETCHER 'Comparative fungitoxic and plant growth regulating properties of triazole derivatives'		
A	MED. FAC. LANDBOUWW. RIJKSUNIV. GHENT vol. 48, no. 3, 1983, pages 551 - 557 H.JENNRICH 'Versuchsergebnisse mit vinclozolin bei der bekämpfung von sclerotium cepivorum bei allium-arten'		TECHNICAL FIELDS SEARCHED (Int. Cl.5)
A	PROCEEDINGS 1981 BRITISH CROP PROTECTION CONFERENCE-PEST AND DISEASES 11TH, no. 2, 1981, pages 459 - 466 J.R.COLEY 'Possibilities for biological and integrated control of white rot disease of allium'		A01N
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 28 JANUARY 1993	Examiner DALKAFOUKI A.
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